DERWENT-ACC-NO: 1996-021012

DERWENT-WEEK: 199603

TITLE: **Saw blade** testing appts. for band or circular **saw** in sawmill - has wishbone shaped holder with **brake** plugs subject to controlled pressurised air on either side which apply braking force to **saw blade** while rotating with sensors determining holder displacement

INVENTOR: KIRBACH, E; SYKES, D A

PATENT-ASSIGNEE: FORINTEK CANADA CORP[FORJ]

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G01N003/20 , G01N003/58

ABSTRACTED-PUB-NO: CA 2140991A

BASIC-ABSTRACT:

The appts. includes a wishbone shaped holder (22), a **brake** (26), and linear movement sensors (40). The wishbone part is mounted for restrictive movement in a plane parallel to the **saw blade** (10) movement. The **saw blade** moves in a slot (24) within the wishbone holder and the **brake** is provide on both sides of the slot. The **brake** is provided with plugs (28) on both sides of the slot which push against both sides of the **saw** using air pressure.

While moving in the slot, the **brake** applies a braking force on the **blade** moving through the slot. The sensor determines the linear motion of the wishbone part from a central position to determine the deflection of the moving **saw blade** under application of the **saw blade**. The air pressure may be varied to vary the braking force on the **blade**.

USE/ADVANTAGE - Determines internal stress pattern within saw blade while in operation. Measurements are carried out in reproducible and measurable manner.

CHOSEN-DRAWING: Dwg.1,2/4

TITLE-TERMS: **SAW BLADE** TEST APPARATUS BAND CIRCULAR **SAW** SAWMILL WISHBONE SHAPE
HOLD **BRAKE** PLUG SUBJECT CONTROL
PRESSURISED AIR SIDE APPLY **BRAKE**
FORCE **SAW BLADE** ROTATING SENSE
DETERMINE HOLD DISPLACEMENT

DERWENT-CLASS: S03

EPI-CODES: S03-F02B; S03-F02C; S03-F02D;

SECONDARY-ACC-NO:
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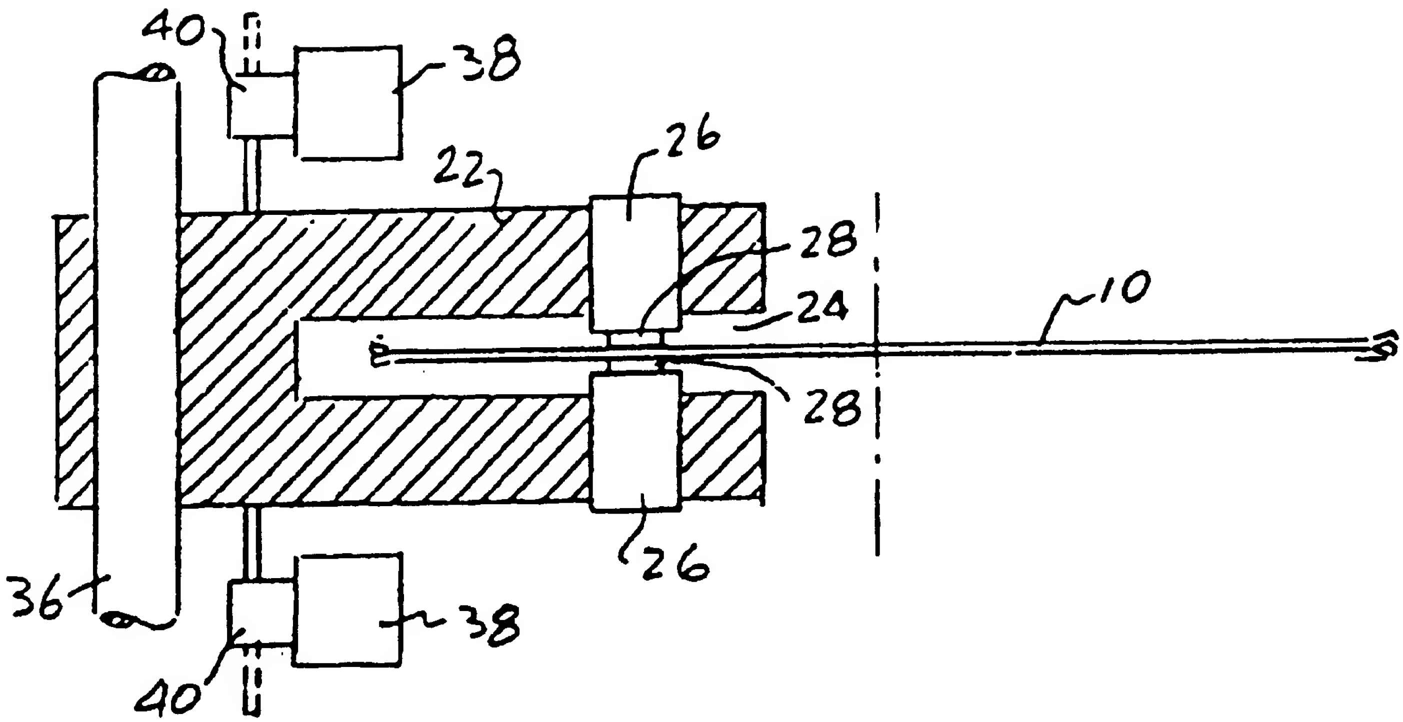

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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Apparatus for Predicting the Cutting Performance of Saws

(72) Kirbach, Eberhard - Canada ;
Sykes, David A. - Canada ;

(71) Forintek Canada Corp. - Canada ;

(30) (US) 08/215,550 1994/03/22

(57) 22 Claims

Notice: This application is as filed and may therefore contain an incomplete specification.

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ABSTRACT OF THE DISCLOSURE

An apparatus for predicting the cutting performance of saws allows saws to be tested prior to installation in a sawmill and ensure that maximum cutting performance is obtained. The apparatus is used in a sawing device wherein a saw blade, either a circular saw blade or a band saw blade, moves past a sawing area at a sawing speed. A wishbone member is mounted for restricted movement perpendicular to a plane of the saw blade, the wishbone member having a slot therein in which the saw blade moves. Brake pads are provided on both sides of the slot in the wishbone member for applying a braking force on both sides of the saw blade moving in the slot, and a sensor determines linear movement of the wishbone member from a center position to determine deflection of the moving saw blade under the application of the braking force.

APPARATUS FOR PREDICTING THE CUTTING PERFORMANCE OF SAWS

The present invention relates to testing saw blades, both circular saw blades and band saw blades, and more specifically to determine the cutting performance of saw blades before they are used in sawmills and the like.

Circular saw blades today are made of thinner material than in the past. By making a thinner blade, one reduces the thickness of cut, thus reducing wood loss. Using thin saws is only justified when at the same time sawing deviation is kept at a minimum.

The cutting performance of a saw blade is the function of many variables. These include properties, physical condition and dimension of the wood piece, dimensions, lateral support and operational speed of the saw blade and stiffness of the saw blade as related to levelling, tensioning and the internal strength of the saw blade material. It is known that saw blades differ widely in their cutting performance for the same wood variables and the same blade dimensions. It is known that the stiffness of saw blades varies from blade to blade and tensioning and internal strength of the saw blade are also affected.

At present there are no exact methods of measuring the tensioning and internal strength within a saw blade. Saw blades may be examined by placing a straight edge across the saw which is slightly lifted. A light gap is formed underneath the straight edge and then the gap thickness across the surface of the saw blade is measured. This is an indirect method of measuring the internal stress pattern in a saw blade. It tends to be

unscientific and based generally on judgement of the person conducting the test.

When sawing occurs, it is known that a saw blade tends to deflect to either one side or the other and this causes a discrepancy in the thickness of wood pieces exiting from the saw. When lumber is cut, there are generally a plurality of saw blades mounted on an arbor referred to as gang saws, the saw blades being spaced along the arbor. If one of these saw blades should deflect, then the result is that the pieces of wood on each side have different dimensions, one being narrower and one being wider. Clearly this is undesirable, particularly when tolerances are becoming more and more important. Furthermore, it has been found that this tends to happen more today than when thicker blades were used because people are using the thinner saw blades than those used in the past to maximize the use of the wood.

Attempts have been made in the past to develop methods which reliably predict the cutting performance of saw blades. One method is based on the natural frequencies of saw blades and has been somewhat successful with small diameter saws, but when applied to the type of saws used in sawmill operations, it has not been found successful. A second method relates to a one side loading of the saw blade in stationary or rotating conditions, but again this has not proved satisfactory. One example of such a method is disclosed by Dyer et al in U.S. Patent 4,498,345 which measures deflection of a blade by fluid flow. The deflection being measured by a sensor to generate a signal related to blade flexure.

It is an aim of the present invention to develop a testing arrangement for both circular and band saw blades wherein the saw blade is moved at a cutting speed, braked on both sides of the cutting teeth and then allowed to

deflect due to the loading of the saw blade. This deflection is measured, and from this can be determined a predictability of the cutting performance of the saw blade.

In the case of a circular saw blade, it is an aim of the invention to provide a testing arrangement that can be located in the filing room where saw blades are prepared and sharpened, so that saw blades can be tested in the filing room before being mounted on the saw arbors in the sawmill. In the case of band saws, whereas a testing device may be provided in a filing room, such a device, however, is more complex and expensive, thus it is more common to carry out tests on band saw blades on the band saw machine itself.

The testing machine for circular saws has an arbor on which the saw can be mounted and a variable speed drive, thus permitting the saw blade to be rotated at a normal cutting speed. Two plugs are provided operating from compressed air from either side of the saw blade pressing just below the gullet of the blade and these plugs have a braking affect representing the load on a saw blade when sawing.

The plugs themselves are mounted on each side of a wishbone style holder which in turn is keyed to a rod or bar adjacent the saw blade. Thus, if the saw deflects, the wishbone holder slides on the rod or bar and there is a probe to determine the movement of this holder which in turn provides an indication of deflection. With this indication of deflection and knowing the load applied to the saw blade and the rotation or speed of the saw blade, one is able to predict the deflection during cutting and thus ensure that saw blades all comply within certain limits of deflection under load and cutting speed.

The present invention provides in a sawing device wherein a saw blade moves past a sawing area at a sawing speed, the improvement comprising: a wishbone member mounted for restricted movement perpendicular to a plane of the saw blade, the wishbone member having a slot therein in which the saw blade moves; brake means on both sides of the slot in the wishbone member for applying a braking force on both sides of the saw blade moving in the slot, and a sensing means to determine linear movement of the wishbone member from a center position to determine deflection of the moving saw blade under application of the braking force.

In a further embodiment there is provided an apparatus for predicting cutting performance of circular saw blades comprising: an arbor for supporting a circular saw blade for rotation; drive means to rotate the arbor about an axis of rotation at a rotational cutting speed; a wishbone member mounted for restricted movement parallel to the axis of rotation of the arbor, the wishbone member having a slot therein in which the saw blade rotates; brake means on both sides of the slot in the wishbone member for applying a braking force on both sides of the saw blade rotating in the slot, and a sensing means to determine linear movement of the wishbone member from a center position to determine deflection of the rotating saw blade under application of the braking force.

In a still further embodiment there is provided a method of predicting the cutting performance of a saw blade comprising the steps of: moving the saw blade at a cutting speed; applying a braking force to both sides of the saw blade, the braking force representing a sawing load on the saw blade, and measuring displacement of the moving saw blade under load from either side a center

position to determine deflection of the saw blade under the sawing load.

In drawings which illustrate embodiments of the present invention,

Figure 1 is a side elevational view showing a rotating saw blade mounted on an arbor powered by a driving mechanism and having a braking device to apply a braking force to the saw blade according to one embodiment of the present invention,

Figure 2 is a sectional view showing the braking device arrangement as shown in Figure 1,

Figure 3 is a detail sectional view showing the braking plugs applied to a saw blade,

Figure 4 is a partial elevational view showing the braking device applied to a band saw blade.

Referring now to Figures 1 to 3, a circular saw blade 10 is shown mounted on an arbor 12 which in turn is rotated by a mechanical driving mechanism 14 through belt 16. A saw guide 18 is shown on arm 20. The saw guide 18 guides the saw blade, allowing no lateral movement.

A wishbone holder 22 has a slot 24 therein as shown in Figure 2 in which the saw blade 10 fits. Brake chambers 26 are positioned one on each side of the slot 24 in the wishbone holder 22 having brake plugs 28 therein that press against the saw blade 10 below the gullet. The brake chambers 26 have compressed air inlets 30 connected to a compressed air line 32 which in turn has a valve 34 attached thereto to control air pressure to the brake chambers 26. As can be seen in Figure 3, when the brake chambers 26 are pressurized the brake

plugs 28 are pushed against both sides of the saw blade 10 to provide a braking force. By varying the air pressure, the braking force applied to the saw blade 10 may be changed.

As shown in Figure 2, the wishbone holder 22 is mounted on a keyed shaft or rod 36 so that the wishbone holder 22 can slide backward and forward on the rod 36 which is parallel to the arbor 12 thus the movement of the wishbone holder 22 is perpendicular to the plane of the saw blade 10.

The wishbone holder 22 moves freely on the rod 36, thus deflection of the blade 10 either side of a center position when it is rotating causes the wishbone holder 22 to move away from the center position representing a flat saw blade 10. Stops 38 are positioned on each side of the wishbone holder 22 as shown in Figure 2 so that the wishbone holder has restricted movement and cannot move too far, thus preventing the blade becoming too distorted. Probes 40 are shown attached to the stops 38 and provide a measurement of movement of the wishbone holder either side of the center position on the rod 36. This measurement represents the deflection of the saw blade from the center position. The maximum allowable deflection depends upon the sawing tolerances permitted, particularly when saw blades are mounted in a gang arrangement on an arbor. If the deflection is greater than a predetermined amount, then the saw blade is discarded and not used on the saw machine.

A different type of probe 42 is shown on the saw blade 10 in Figure 1 above the wishbone holder 22 which measures deflection of the actual saw blade below the gullet rather than the deflection of wishbone holder. The predetermined deflection for the location of the probe on the blade is determined according to the

required tolerances of thickness for sawing. The probe may be a laser base non-contact probe or other known types of probes.

The compressed air and plugs 28 have a predetermined braking affect or gripping affect on the saw blade 10 and this can be changed for different types of saw blades, depending upon thickness. If a saw blade is rejected, then it may be returned for pretensioning and then retested to ensure that the deflection of the saw blade is within the acceptable limits for sawing. These acceptable limits are determined by the acceptable width tolerances for the sawn product.

Figure 4 illustrates a band saw blade 50 with guides 52 above and below the wishbone holder 22. Deflection of the band saw blade 50 is measured in the same way as shown in Figures 2 and 3. The speed of the band saw blade 50 is a normal cutting speed and the braking force applied to the blade in the gullet portion represents the load on the saw blade 50 when sawing.

Various changes may be made to the embodiments shown herein. Whereas the brake plugs 28 are shown being pressured by compressed air, this force could be by hydraulic or mechanical means. A variation to the force however is required for different types of blades and different speeds. The testing device shown in Figure 1 for a rotary blade is not a saw machine, but represents a testing device suitable for positioning in a filing room, thus the saw blades can be tested in the filing room before they are used in a saw machine for sawing a product. In the case of a band saw blade, it is likely that the wishbone holder 22 and rod 36 would be mounted for testing purposes only on the band saw machine at a location where sawing occurs.

Various changes may be made to the embodiments shown herein without departing from the scope of the present invention which is limited only by the following claims.

The embodiments of the present invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a sawing device wherein a saw blade moves past a sawing area at a sawing speed, the improvement comprising:

a wishbone member mounted for restricted movement perpendicular to a plane of the saw blade, the wishbone member having a slot therein in which the saw blade moves;

brake means on both sides of the slot in the wishbone member for applying a braking force on both sides of the saw blade moving in the slot, and

a sensing means to determine linear movement of the wishbone member from a center position to determine deflection of the moving saw blade under the application of the braking force.

2. The sawing device according to claim 1 wherein the wishbone member is mounted for sliding movement on a rod perpendicular to the plane of the saw blade.

3. The sawing device according to claim 2 including stops positioned to restrict movement of the wishbone member on the rod a predetermined distance on either side of the center position.

4. The sawing device according to claim 1 wherein the sensing means comprises at least one sensor to measure movement of the wishbone member on either side of the center position.

5. The sawing device according to claim 1 wherein the brake means comprise plugs on both sides of the slot pushing against both sides of the saw blade by air pressure.

6. The sawing device according to claim 5 including means to vary the air pressure to vary the braking force on both sides of the saw blade.

7. The sawing device according to claim 1 wherein the saw blade is a circular saw blade.

8. The sawing device according to claim 1 wherein the saw blade is a band saw blade.

9. An apparatus for predicting cutting performance of circular saw blades comprising:

an arbor for supporting a circular saw blade for rotation;

drive means to rotate the arbor about an axis of rotation at a rotational cutting speed;

a wishbone member mounted for restricted movement parallel to the axis of rotation of the arbor, the wishbone member having a slot therein in which the saw blade rotates;

brake means on both sides of the slot in the wishbone member for applying a braking force on both sides of the saw blade rotating in the slot, and

a sensing means to determine linear movement of the wishbone member from a center position to determine deflection of the rotating saw blade under application of the braking force.

10. The apparatus for predicting cutting performance of circular saw blades according to claim 9 wherein the wishbone member is mounted for sliding movement on a rod parallel to the axis of rotation of the arbor.

11. The apparatus for predicting cutting performance of circular saw blades according to claim 10 including stops positioned to restrict movement of the wishbone member on the rod a predetermined distance on either side of the center position.

12. The apparatus for predicting cutting performance of circular saw blades according to claim 9 wherein the sensing means comprises sensors on each side of the saw blade to measure movement of the wishbone member on either side of the center position.

13. The apparatus for predicting cutting performance of circular saw blades according to claim 9 wherein the brake means comprises plugs on both sides of the slot pushing against both sides of the saw blade by air pressure.

14. The apparatus for predicting cutting performance of circular saw blades according to claim 13 including means to vary the air pressure to vary the braking force on both sides of the saw blade.

15. The apparatus for predicting cutting performance of circular saw blades according to claim 9 wherein the drive means to rotate the arbor provides varying rotational speeds.

16. A method of predicting the cutting performance of a saw blade comprising the steps of:

moving the saw blade at a cutting speed;

applying a braking force to both sides of the saw blade, the braking force representing a sawing load on the saw blade, and

measuring displacement of the moving saw blade under load from either side of a center position to determine deflection of the saw blade under the sawing load.

17. The method of predicting the cutting performance of a saw blade according to claim 16 wherein the saw blade is a circular saw blade rotating on an arbor.

18. The method of predicting the cutting performance of a saw blade according to claim 16 wherein the saw blade is a band saw blade.

19. The method of predicting the cutting performance of a saw blade according to claim 16 wherein the braking force is applied by plugs pushing against both sides of the saw blade by air pressure.

20. The method of predicting the cutting performance of a saw blade according to claim 19 wherein the air pressure is varied to vary the braking force.

21. The method of predicting the cutting performance of a saw blade according to claim 19 wherein the saw blade moves in a slot of a wishbone member, the plugs being attached on both inside surfaces of the wishbone member to press against the saw blade, and the wishbone member being mounted for restricted movement perpendicular to a plane of the saw blade.

22. The method of predicting the cutting performance of a saw blade according to claim 21 wherein the displacement of the moving saw blade is measured by

sensing means to measure movement of the wishbone member on the rod on either side of the center position.

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Fig. 1.

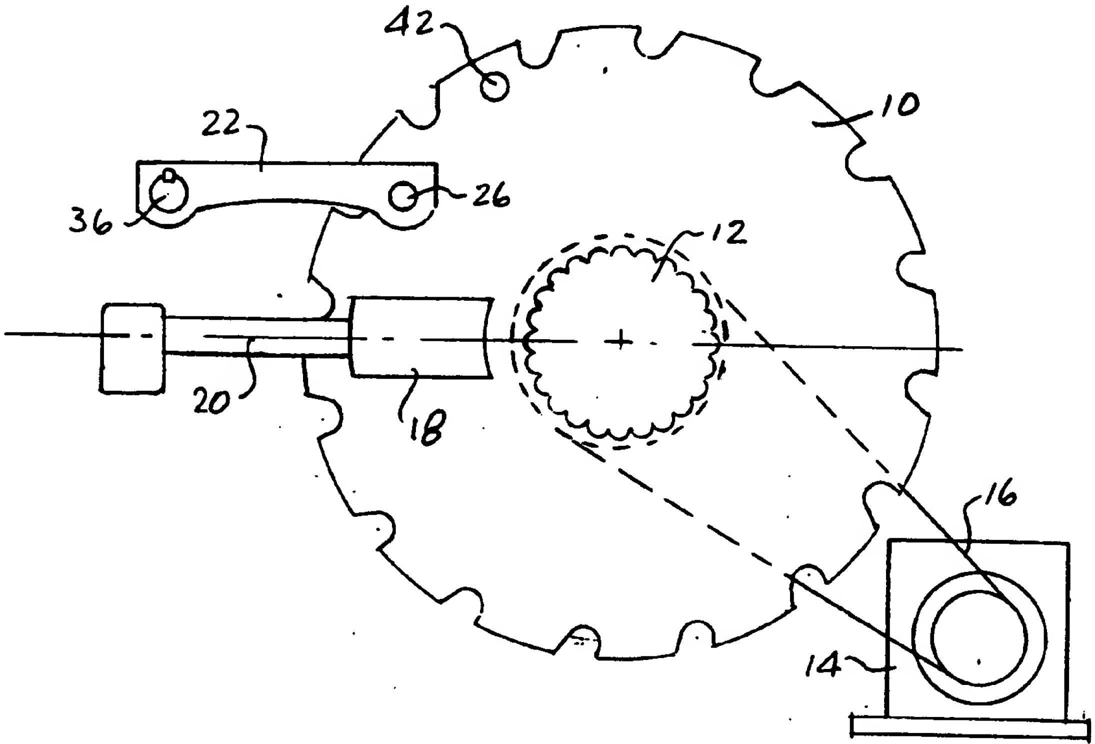

Fig. 2.

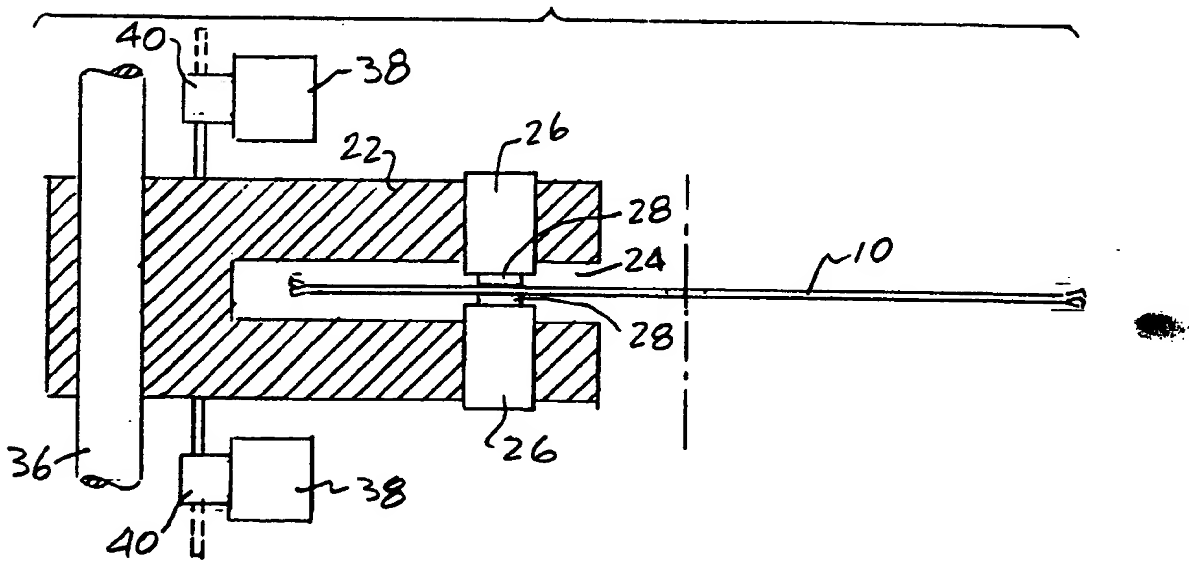

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Fig. 3.

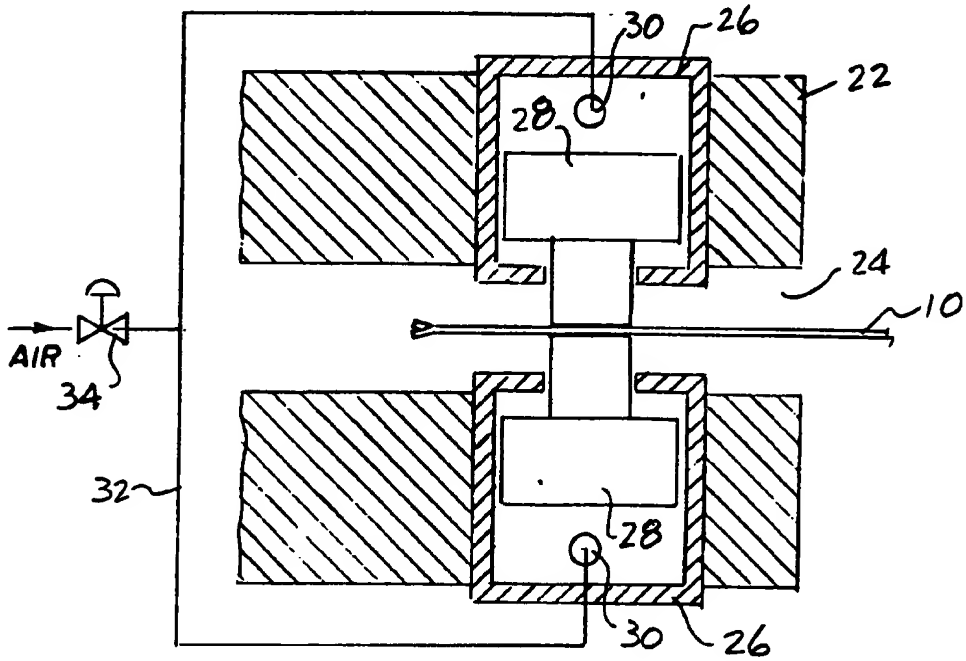

Fig. 4.